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eaten more in southern Japan, it is not a common article of diet among the poorer classes. This fact, and also the fact that the parasite is so much more common in men than in women, rather detract still more from the probability of such a source of infection. (See also Abattoir inspection.) Should the unexpected prove to be the case, and Bullard's encysted form actually represent the long looked for stage of *P. Westermanii*, ordinary curing or cooking will undoubtedly prevent all danger of infection. Of all possible sources of infection thus far suggested, the water supply and the mollusks would appear to be more natural carriers of the cercarian stage than anything else. The lion, cat, dog, hog, and man—all of the animals for which this lung fluke[1] has been reported—are in the habit of eating meat, but all of them also drink water.

THE LUNG FLUKE IN MAN AS CAUSE OF PARASITIC HEMOPTYSIS AND JACKSONIAN (CORTICAL) EPILEPSY.

NAME OF THE DISEASE.—The disease now under discussion is known under the following names:

ENGLISH.—*Parasitical hæmoptysis* Manson, 1880, and The Lancet, 1880, *Endemic hæmoptysis* Manson, 1883; *Lung fluke disease* (as vernacular term); Pulmonary distomatosis (in part).

GERMAN.—*Parasitäre Hæmoptoë* Baelz, 1880; *Gregarinose pulmonum* Baelz, 1880; *Wurm Hæmoptoe* Leuckart, 1889; *Lungendistomen-Krankheit* Yamagiwa, 1892; *Distomatose pulmonum.*

FRENCH.—*Hémoptysie parasitaire* Chédan, 1886; *Distomatose pulmonaire* Blanchard, 1895.

ITALIAN.—*Emottisi parassitica* Sonsino, 1884; *Emottisi cronica* Sonsino, 1896.

SPANISH.—*Hemoptisis parasitaria* Bonis & Cortezo, 1882.

LATIN.—*Gregarinosis pulmonis* Bonis & Cortezo, 1882.

The presence of lung flukes in man causes various symptoms, according to the location of the parasites. The two chief clinical forms in which the malady appears are the so-called parasitic hemoptysis and parasitic hemoptysis in connection with Jacksonian (cortical) epilepsy.

GEOGRAPHICAL DISTRIBUTION OF THE DISEASE.—Lung fluke disease has been reported for the following places:

Japan.—Hon-Shu Island, from northeast (provinces of Awomori, Sendai, Izu, Shinano, and Gifu) to southwest (provinces of Okayama, Shimane, and Yamaguchi); also on the Kiushu Islands (provinces of Kumamoto, Nagasaki, and Kagoshima). (See Yamagiwa, 1892, p. 453.)

China.—North Formosa, especially, and Manson believes the large number of cases of hemoptysis he formerly noticed in central and southern Formosa, are of the same nature. (See Manson, 1882.)

Korea.—Case of a Korean royal prince. (See Baelz, 1883.)

The Philippines.—It probably occurs in the Philippines, but this is not yet demonstrated.

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[1] *Herpestes*, the host of *Paragonimus compactus*, and *Lutra*, the host of *P. rudis*, are also carnivorous.

FREQUENCY.—In a number of articles the statement is found that in certain parts of Formosa 15 per cent of the inhabitants are affected. This statement is in at least one article attributed to physicians, but it appears to be due to an estimate made by a servant. Manson (1882) says, in referring to 2 Chinese patients:

> Regarding their acquaintances, 1 of them said that 20 or 30 per cent, the other that 15 per cent, spat blood. Possibly these are over-estimates, but at all events they show that the disease is extremely prevalent.

Baelz in a letter to Leuckart (1889) states that he knows of 1 village in Japan in which nearly all the inhabitants harbor lung worms. Taylor (1883) thinks it too early to make statements regarding the frequency of the malady, for the disease is usually mistaken for tuberculosis, since it can be diagnosed only with the aid of the microscope (not much used by Japanese physicians at that date) and since only a portion of the cases come to the notice of physicians. Blanchard (1895) states that in the provinces of Okayama and Kumamoto, both mountainous, the disease is so frequent in certain villages and so dreaded that the inhabitants of neighboring villages will have no relations with them, and even the physicians do not wish to go there because of fear of infection. (The origin of this statement has escaped us. See, however, Railliet, 1893, p. 370.)

PREDISPOSITION.—According to Yamagiwa (1892), certain persons are more predisposed to the disease than others. From a helminthological standpoint, it may be questioned whether the fact that the disease has been found more in certain classes of patients than in others is due to an actual predisposition, or whether it is not due rather to a greater risk of infection to which some persons may be subject. Thus tapeworms appear to be more common in women than in men, but this fact is due to women's being more liable to infection (in preparing food) rather than to any constitutional predisposition. The various data gathered thus far are as follows:

Age.—While the disease may attack persons of any age, it appears to be rarely diagnosed in very young or very old persons. From present statistics, it is more common in persons in youth and early manhood. Thus of 59 cases compiled from literature, 45 were from patients between 11 and 30 years old.

Sex.—Judging from statements by Eastern authors and from accessible statistics, the disease is more frequently diagnosed in male than in female patients, and it may therefore be assumed that men are more exposed to infection than women. Thus, of 66 compiled cases of known sex, 58 were males and 8 were females.

Occupation.—Taylor (1883) says that the parasite attacks persons irrespective of occupation. He is undoubtedly correct in this intimation that occupation is no protection against infection, if the person is exposed. Yet there need be no surprise, if, as is to be expected, persons following certain occupations will be more subject to infection than persons otherwise employed. From the few statistics thus far collected, relative to occupation, it may be noted that of 51 patients 38 were farmers, 6 officials, 1 student, 1 laborer, 1 merchant, 1 coolie, 1 house boy, 1 shoemaker, 1 prince. Yamagiwa (1892) states that in Kumamoto students (hospital cases) are among the most frequently affected.

Personal habits.—Yamagiwa (1892) records that 12 patients out of 38 were drinkers.

Physical condition.—Several authors state that persons of strong constitution are more subject to the disease than persons of weak constitution.

DURATION.—It is generally conceded that patients may live for years—ten to twenty, or perhaps more—after noticing the first symptoms.

PROGNOSIS.—Patients may entirely recover if sent into a healthy noninfected area. Yamagiwa has repeatedly noticed cases of this kind, where egg cysts were found in the mesentery, mediastinum, or lungs, but no adult worm was found. In general, the prognosis depends upon (*a*) the number and (*b*) position of the parasites present (*c*), age of patient, and (*d*) complications.

(*a*) The greater the number of parasites in the lungs the greater is the chance of severe pulmonary hemorrhage or of emboli in the brain.

(*b*) If the worms are confined to the lungs the patient may live for years; severe hemorrhage or repeated profuse hemorrhages are naturally dangerous in proportion to the amount of blood lost within a given time. If the parasites or their eggs gain access to the brain, the prognosis is unfavorable.

(*c*) According to Yamagiwa (1892) development of patients under 10 years of age is retarded by lung worm infection, while in old patients the nourishment is considerably impaired.

(*d*) When complicated with pulmonary tuberculosis, prognosis is unfavorable.

DIAGNOSIS.—Microscopic examination of sputa for *Paragonimus* eggs.

TREATMENT.—Manson (1882) tried several treatments by inhalations, and thought they were not entirely unsuccessful. Taylor (1883) has no confidence in specific treatment, but advises a general course of medication, according to indication. Yamagiwa (1892) knows of no practical specific medical treatment. He thinks surgery might be tried if the exact position of the more superficial cysts could be more definitely located (X-rays?). By change to an uninfected region danger of reinfection is avoided and the parasites may disappear, becoming disintegrated or (see p. 589), in some cases, possibly by being coughed up.

PROPHYLAXIS.—Positive prophylactic measures can not be given until the cercaria stage of the parasite is found. In general, however, care regarding the drinking water—to have it filtered or boiled—appears to be the most probable preventive measure which can now be proposed. There appear to be no valid grounds at present for suspecting eggs, fish, or meat, as suggested by some of our Japanese colleagues.

The following measures would undoubtedly accomplish much in preventing the disease from spreading:

(*a*) Infected patients should use sputum boxes, such as are used by consumptives. If cuspidors are used, it would be positively dangerous to empty their contents into any drain the sewage of which does not go directly into the sea. In all probability salt water would kill the miracidium. To empty cuspidors into a drain, the sewage of which is used for fertilizing, would be deliberately to comply with conditions which would be, on general principles, most favorable to the spread of the disease. If the sewage drains into a river, the conditions for spreading the disease would also be very favorable. A comparison of the relative merits of the dry versus the wet cuspidor can not be given until experiments in drying the eggs are conducted. On general principles the dry cuspidor would be better in this case (contrary to the conditions in tuberculosis), since as a rule trematode eggs are easily killed by drying.

(*b*) Cats and dogs which cough up blood should be examined for this parasite, and if *Paragonimus* eggs are found in the expectorations the animals should be killed and burned.

(*c*) If hogs are discovered coughing up a dirty yellow, brown, or bloody expectoration, they should immediately be sent to slaughter. In abattoir inspection infected portions should be "tanked for fertilizer," but if healthy the meat of such a hog may be safely placed on the market. (See Abattoir inspection.)

SYMPTOMS.—The symptoms vary according to the location of the parasite.

(*a*) *Lung infection.*—This is the usual form. Sputa very similar to that seen in pneumonia, and of a dirty red to brown color, due to the presence of microscopic worm eggs; spitting of blood common, but not constant, often intermittent; cough common, but not constant. All symptoms increased after violent exertion. *The only constant and specific characteristic is the presence of the eggs in the sputum; as many as 12,000 eggs may be expectorated daily.*

Manson (1882), gives the following as a typical case:

Heng, male, æt. 31; resides in Sinhang, Tamsui, where he works as a house coolie. His family, he says, is quite healthy; his mother, age 44, and 3 brothers and 4 sisters, are alive and well. His father died at 58 of dropsy and a sister died in childhood of smallpox. He himself is liable to ague. He was born in the town of Banka and lived there till his 18th year; then he lived in Kelung for two or three years; afterwards he removed to Hebe, Tamsui, where his home has been for the last ten years. He has traveled about the north part of the island a good deal; been in Tekchham two or three years ago; and eight months ago accompanied some Japanese to Khilai, on the east coast, where he resided upwards of a month. His blood spitting dates from eleven years ago; he was then working on the tea hills with his father near Banka. At first he noticed when he breathed hard in carrying heavy burdens that he coughed a little and brought up mucus mixed with blood, but, as a rule, unless exerting himself violently, he only brings up a few drops mixed with the mucus. Sometimes he does not spit for a few days, perhaps a month on end, and then the hemoptysis recurs, to last for one to two months. He has a slight cough, but on auscultation nothing much amiss can be detected. His thorax is finely developed.

Lung infection may be complicated by infection of the (*b*) brain, (*c*) liver, or (*d*) other organs.

(*b*) *Brain infection.*—If the worms or their eggs gain access to the brain, epileptiform attacks (Jacksonian, or cortical, epilepsy) may result. Cases have been reported by Otani (1887), Inoui and Yamagiwa (1889), and Yamagiwa (1890). The best accessible account of such cases is in Yamagiwa's (1890) paper.

(*c*) *Liver infection.*—Two cases of cirrhosis of the liver with ascites have been observed; *Paragonimus* eggs were found in the interstitial tissue. (Yamagiwa, 1892, p. 453.)

(*d*) *Infection of other organs.*—Cysts of *Paragonimus* eggs in the mesentery, great omentum, etc., have not produced any notable symptoms.

PATHOLOGY.—(*a*) *Lung infection.*—On the surface of the lungs or directly under the pleura cysts are formed which are usually smooth. The cyst wall is composed of newly formed tissue with round-cell infiltration and of loops of the blood vessels in the surrounding tissue. These cysts may contain 1, 2, or several specimens of *Paragonimus* with their eggs, or only the eggs may be found; Charcot's crystals are always present, and occasionally cholestearin crystals.

(*b*) *Brain infection.*—Cysts with the parasite and eggs or the eggs alone, causing emboli, may be found in the brain.

(*c*) *Liver infection.*—Cirrhosis of the liver resulting from emboli of eggs in the portal area (or perhaps coexistence of *Paragonimus* egg emboli with cirrhosis of the liver due to other causes.)—(Yamagiwa, 1892, p. 454.)

(*d*) *Infection of other organs.*—Cysts containing eggs of *Paragonimus* and fibrous nodules have been found in the mediastinum, diaphragm, mesenterium, and walls of the intestines; and Otani is said to have found abscesses in the cervical and inguinal regions caused by trematodes. Eggs have also been found in the contents of the intestine. No lesions have been noticed in the spleen or the kidneys.

ABATTOIR INSPECTION.—All lungs of hogs found to contain this worm should be "tanked" for fertilizer, in order to prevent dissemination of the eggs. There is, however, no danger of the direct transmission of the worm from hogs to man, since analogy with other members of the same family (Fasciolidæ) of parasites leads us to assume confidently that this species must pass through an invertebrate intermediate host (probably some mollusk) before it can infect another host. There is, therefore, not the slightest danger of infection from the eggs of the flukes connected with eating the pork from a hog which harbors the parasite in question, and inspectors should not, therefore, condemn the meat of such animals on the ground of the presence of the worms in the lungs.

FLOATING DISINFECTING PLANTS SENT TO MATANZAS AND CIENFUEGOS, CUBA.

The Marine-Hospital Service has just sent to Cuba 2 floating disinfecting plants equipped with all modern disinfecting machinery for service at the ports of Matanzas and Cienfuegos, respectively.

In constructing these barges, the hulks of sailing vessels were purchased, the necessary alterations made to fit them for the reception of machinery, and they were then provided with steam chambers, formaldehyd apparatus, sulphur furnaces, bichloride pumps, etc. A large iron steamer took the 2 vessels in tow at the port of Philadelphia, and they arrived at their destinations without any mishap, and are now anchored in convenient positions in the harbors, ready for immediate service. The *Guardian* was sent to Matanzas arriving December 4, and the *Sentinel* to Cienfuegos arriving December 8.

[Reports to the Surgeon-General United States Marine-Hospital Service.]

Smallpox in Houston County, Ga.

MOBILE, ALA., *December 7, 1900.*

SIR: In obedience to orders received December 2, 1900, directing me to proceed at once to Perry, Houston County, Ga., and confer with local authorities and decide disputed diagnosis of smallpox, and to advise authorities as to best method of management, etc., I have the honor to state that I left Mobile at 12 o'clock midnight December 2, arriving at Fort Valley, in Houston County, the afternoon of the 3d; this was Sunday, and as no trains are run from Fort Valley to Perry on Sunday, I took a private conveyance, thus saving about eighteen hours' time. I arrived at Perry the same evening. The mayor of the city, Colonel Davis, called the same evening and we talked over the situation. The municipal authorities were not particularly interested except as to preventive measures, as the disease has not developed in the town of Perry yet, but is on several plantations in different parts of the county.

The county judge or ordinary, Judge Hearst, was present at this consultation, as he represented the county, and was more particularly interested. I adopted his suggestion to visit the different sections of the county and see each separate set of cases.

It has generally been my practice when there is a difference of opinion as to diagnosis, to request the attendance of at least 1 physician from each side, in order that I may make the differential diagnosis in their presence and point out the different phases of the disease to them; but in this case Drs. Cater and Williams, the only physicians who had seen the disease, agreed, as I afterwards found, that it is smallpox, but owing to the mildness of the type the people in the vicinity were unwilling to accept this opinion or to take proper precautions. I was, therefore, requested to visit the cases alone.